

## CLAIMS

1. A system for controlling a linear compressor (10), the linear compressor (10) comprising:
- a movable assembly (1);
  - 5       - a motor (1') fed by an application voltage ( $V_T$ ), an electronic switching device (52); and
  - an electronic circuit (51) controlling the electronic switching device (52) to control the application voltage ( $V_T$ ) applied to the motor (1'), and the motor (1') driving the movable assembly (1);
- 10       the system being characterized in that:
- the electronic circuit (51) measures an actuation phase ( $\phi_C$ ) of the current circulating in the motor (1') and a dynamic phase ( $\phi_P$ ) of the movable assembly (1) and establishes a relationship between the actuation phase ( $\phi_C$ ) and the dynamic phase ( $\phi_P$ ), determining a measured phase ( $\phi_{PC}$ ),
  - 15       - the electronic circuit (51) obtains a value of a correction voltage ( $V_F$ ) from the value of the measured phase ( $\phi_{PC}$ ),
  - the electronic circuit (51) obtains a value of a defined voltage ( $V_P$ ) from a physical position (DP) of the movable assembly (1),
  - the electronic circuit (51) actuates on the value of the application voltage ( $V_T$ ) from the sum of the correction voltage ( $V_F$ ) and the defined voltage ( $V_P$ ).
- 20       2. A system according to claim 1, characterized in that the dynamic phase ( $\phi_P$ ) is obtained from a velocity of displacement of the movable assembly (1).
- 25       3. A system according to claim 2, characterized in that the electronic system (51) determines the value of the defined voltage ( $V_P$ ) from the comparison of the value of the measurement of the physical position (DP) of the movable assembly (1) with a previously established defined physical position ( $DP_{REF}$ ).
- 30       4. A system according to claim 3, characterized in that the electronic circuit (51) commands the electronic de switching device (52) to apply application voltage ( $V_T$ ) to the motor (1').

5. A system according to claim 4, characterized in that the electronic circuit (51) obtains the value of the actuation phase ( $\phi_C$ ) from the comparison of measurements of phases of a zero level of voltage (ZT) of the application voltage ( $V_T$ ) applied to the motor (1') with a zero level of current (ZC) of the circulating current in the motor (1').

6. A system according to claim 5, characterized in that the electronic circuit (51) obtains the value of the dynamic phase ( $\phi_P$ ) from the comparison of measurements of the physical position (DP) of the movable assembly (1) with the measurement of the zero level of the voltage (ZT) applied to the motor (1').

7. A system according to claim 6, characterized in that the value of the defined voltage ( $V_P$ ) is obtained from a relationship between the value of a maximum physical position ( $DP_{MAX}$ ) proportional to the value of the physical position (DP) and the defined physical position ( $DE_{REF}$ ).

8. A system according to claim 7, characterized by being applicable in a cooling system (57) comprising a temperature sensor (58) associated to an electronic thermostat (59), the electronic thermostat (59) supplying the value of the previously established defined physical position ( $DE_{REF}$ ).

9. A system according to claim 8, characterized by comprising a displacement sensor (55) associated to the control circuit (51), the control circuit (51) receiving the value of the physical position (DP) of the movable assembly (1).

10. A system according to claim 9, characterized in that the signal of zero level of voltage (ZT) of the application voltage ( $V_T$ ) applied to the motor (1') is measured at the entrance of the electronic switching device (52).

11. A system according to claim 10, characterized in that the signal of zero level of current (ZC) of the circulating current in the motor (1') is measured at the exit of an electronic switching device (52).

12. A system according to claim 11, characterized by operating in an stable way, independently of the difference between the dynamic phase ( $\phi_P$ ) and the actuation phase ( $\phi_C$ ).

13. A method of controlling a linear compressor (10), the linear

compressor (10) comprising:

- a movable assembly (1);
- a motor (1') fed by an alternating application voltage ( $V_T$ ), generating a circulating current;

- 5 the method being characterized by comprising the steps of:
- measuring an actuation phase ( $\phi_C$ ) of the circulating current in the motor (1');
  - measuring a dynamic phase ( $\phi_P$ ) of the movable assembly (1),
  - establishing a relationship between the actuation phase ( $\phi_C$ ) and the dynamic phase ( $\phi_P$ ), determining a measured phase ( $\phi_{PC}$ );
  - establishing a relationship between the measured phase ( $\phi_{PC}$ ) and a physical position (DP) of the movable assembly (1), determining a preferable position ( $DP_{MAX}$ ) of the movable assembly (1);
  - establishing a relationship between the measured phase ( $\phi_{PC}$ ) and the preferable position ( $DP_{MAX}$ ), obtaining an application voltage ( $V_T$ ) to be applied to the motor (1').

14. A method according to claim 13, characterized in that, prior to the step of establishing the relationship between the measured phase ( $\phi_{PC}$ ) and the preferable position ( $DP_{MAX}$ ), the method comprises a step of comparison between the value of the preferable position ( $DP_{MAX}$ ) and a previously established defined physical position ( $DP_{REF}$ ) to obtain a value of a defined voltage ( $V_P$ ).
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15. A method according to claim 14, characterized in that, in the step of altering the value of the application voltage ( $V_T$ ), the value of the application voltage ( $V_T$ ) is obtained by summing the values of the defined voltage ( $V_P$ ) and of the correction voltage ( $V_F$ ).
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16. A method according to claim 15, characterized in that, prior to the step of measuring the actuation phase ( $\phi_C$ ) of the circulating current in the motor (1'), a step of obtaining a zero level of current (ZC) of a circulating current in the motor (1') is foreseen.
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17. A method according to claim 16, characterized in that, prior to the step of measuring the dynamic phase ( $\phi_P$ ) of the movable assembly (1),

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the step of obtaining a zero level of voltage (ZT) of the application voltage ( $V_T$ ) applied to the motor (1') is foreseen.

18. A linear compressor (10) comprising:

- a movable assembly (1) positioned inside a pressurization chamber (2) and being operatively associated to a spring (7), the movable assembly (1) moving axially within the pressurization chamber (2);
- a motor (1') fed by an application voltage (VT), generating a circulating current in the motor (1');

- an electronic switching device (52); and

- an electronic circuit (51) controlling the electronic switching device (52), to control the application voltage (VT) applied to the motor (1'), and the motor (1') driving the movable assembly (1);

the linear compressor (10) being characterized in that:

- the control circuit (51) measures an actuation phase ( $\phi_C$ ) of the circulating current in the motor (1') and a dynamic phase ( $\phi_P$ ) of the movable assembly (1) and establishes a relationship between the actuation phase ( $\phi_C$ ) and the dynamic phase ( $\phi_P$ ), determining a measured phase ( $\phi_{PC}$ ), the control circuit (51) alters the value of the application voltage ( $V_T$ ) applied to the motor (1') in a way proportional to the value of the measured phase ( $\phi_{PC}$ ).

19. A compressor according to claim 18, characterized in that the measured phase ( $\phi_{PC}$ ) corresponds to the lag between the actuation phase ( $\phi_C$ ) and the dynamic phase ( $\phi_P$ ) of the movable assembly (1).

20. A compressor according to claim 19, characterized by operating in a stable way, independently of the difference between the dynamic phase ( $\phi_P$ ) and the actuation phase ( $\phi_C$ ).

21. A cooling system characterized by comprising a compressor as defined in claims 18 to 20.